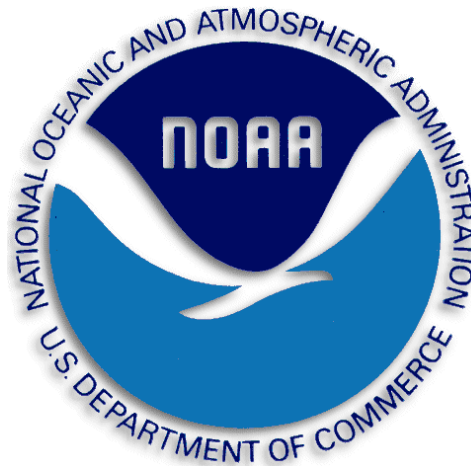


POES IJPS

Archive and Access System Description and Requirements for the Initial Joint Polar-orbiting Operational Satellite System

December 20, 2001



Prepared by:

U.S. Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite, Data, and Information Service (NESDIS)

NOAA/NESDIS

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Preface

This document comprises the NOAA/NESDIS baseline publication of the Archive and Access System Description and Requirements for the Initial Joint Polar-orbiting Operational Satellite System, (December 20, 2001, issue). This document is Revision 0, DCN 0 (document number NOAA-POES/OSD-2001-0007R0UD0).

This document identifies requirements for the NOAA long-term Data Archive and Access System (AAS) element of the Initial Joint Polar-orbiting Operational Satellite System (IJPS). The intent is to provide a baseline for future upgrades needed to support IJPS operations.

Updates and revisions to this document will be produced and controlled by NOAA/NESDIS.

Table of Contents

1.0	Introduction.....	1
1.1	Purpose.....	1
1.2	Scope.....	1
1.3	Document Organization	1
1.4	Applicable Documents.....	2
1.5	Reference Documents	3
2.0	NOAA Archive and Access Systems for POES	4
2.1	Archive.....	4
2.1.1	Mission.....	4
2.1.2	Current System Description.....	4
2.2	Access	8
2.2.1	Mission.....	8
2.2.2	Current System Description.....	8
3.0	System Requirements to Support IJPS	13
3.1	Archive System Requirements.....	13
	Verification Method.....	14
	Definition	14
3.1.1	Functional Requirements	14
3.1.2	Performance Requirements.....	14
3.1.3	Interface Requirements	15
3.1.4	Operational Requirements	15
3.2	Access System Requirements	16
3.2.1	Functional Requirements	16
3.2.2	Performance Requirements.....	17
3.2.3	Interface Requirements	18
3.2.4	Operational Requirements	18
4.0	Keywords with Definitions	19
5.0	Open Issues	20
5.1	TBC.....	20
5.2	TBD.....	20
5.3	TBW.....	20
	Appendix A. Requirements Matrix.....	1
	Appendix B. Acronyms and Abbreviations	1
	Distribution List.....	1

List of Tables

Table 1-1.	Applicable Documents	2
Table 1-2.	Reference Documents.....	3
Table 3-1.	Verification Methods.....	14

1.0 Introduction

1.1 Purpose

The purpose of this document is to define system requirements that are new or modified to support the long-term archive of and access to IJPS data, as well as those requirements that are specific to NESDIS data management practices and procedures. The NOAA IJPS Archive and Access System (AAS) element is a component of NOAA's Comprehensive Large Array-data Stewardship System (CLASS) Information Technology (IT) architecture. The system requirements in this document are traceable to the Polar-orbiting Operational Environmental Satellite (POES) System Requirements for IJPS (AD-1) and the CLASS Archive and Access Requirements (AD-2). In the event that an AAS requirement conflicts with a CLASS requirement, the CLASS requirement shall take precedence.

1.2 Scope

The scope of descriptions and requirements stated in this document primarily address the modifications levied by Metop-1 & -2 and NOAA-N & -N' satellites on the NOAA POES ground segment element that archives and provides end-user access to operational data and products from IJPS operations. Ingest and data processing changes to the NOAA POES ground segment for IJPS, including [pipeline](#) processing of [blind orbit Global Area Coverage \(GAC\)](#) data and split mission scenarios, are largely transparent to the AAS element. The most significant changes to NOAA's current archive and data access systems result from new IJPS data sets and integration with CLASS.

1.3 Document Organization

Section 1.4 lists the applicable documentation that provides input information to the scope of requirements on the POES system.

Section 1.5 lists the reference documentation that provides source information to the scope of requirements on the POES system.

Section 2 provides the mission statements and current system descriptions.

Section 3 provides the formal requirement statements.

1.4 Applicable Documents

Table 1-1 presents a list of Applicable Documents (AD-#) that contain information and/or requirements that need to be applied for the successful completion of the IJPS program.

Table 1-1. Applicable Documents

Doc #	Title	Reference Number	Issue	Date
AD-1	Polar-orbiting Operational Environmental Satellite System Requirements For Initial Joint Polar-orbiting Operational Satellite System (RDN-4)	NO-IJ/OSD-99-0004-R0U0	DCN 0	06 Nov 2001
AD-2	Comprehensive Large Array-data Stewardship System (CLASS) Archive and Access Requirements		1.0	20 Jul 2001
AD-3	Content Standard for Digital Geospatial Metadata	FGDC-STD-001-1998	2.0	Jun 1998
AD-4	IJPS Technical Bilateral, Archive Issues Presentation			08 Mar 2001
AD-5	E-mail from Karen Dacres, NOAA Office of the General Counsel			26 Sep 2001

1.5 Reference Documents

Table 1-2 presents a list of Reference Documents (RD-#) that provide additional useful information for program implementation.

Table 1-2. Reference Documents

Doc #	Title	Reference Number	Issue	Date
RD-1	Program Implementation Plan (PIP) For The Co-operation Between NOAA and EUMETSAT on the IJPS Program			Jul 1999
RD-2	NOAA's Ground Segment Project Plan For Participation in the Initial Joint Polar-orbiting Operational Satellite System			Jun 1999
RD-3	Polar Operational Environmental Satellite Ground Segment Upgrade Description & Requirements for Initial Joint Polar Satellite System (RDN-5)	NO-IJ/OSD-00-0005-R0U0		15 May 2000
RD-4	NESDIS List of IJPS Day One Products		Draft	28 Aug 2000
RD-5	Comprehensive Large Array-data Stewardship System (CLASS) IT Architecture Description		1.0	20 Jul 2001
RD-6	Initial Joint Polar-Orbiting Operational Satellite System (IJPS) Archive and Access Concept of Operations		Draft	18 Oct 2001
RD-7	METSAT Configuration Change Request 1322: SEM – Inverted Data			26 Apr 1995
RD-8	Data Denial Implementation Plan (DDIP) for the Cooperation Between NOAA and EUMETSAT on An Initial Joint Polar-Orbiting Operational Satellite System (IJPS) Agreement		Draft	30 May 2001

2.0 NOAA Archive and Access Systems for POES

2.1 Archive

This section contains a mission statement for NOAA's POES archive and storage systems and descriptions of the current systems and supporting organizations responsible for archiving or storing operational POES data and derived products.

2.1.1 Mission

Within the context of this document, it is the mission of NOAA's archive systems to ensure reliable long-term bit-level preservation and retrieval of operational POES data and derived products using the most cost-effective means available. The mission of NOAA's storage systems are similar, but without a requirement for long-term bit-level preservation.

2.1.2 Current System Description

Several organizations within NOAA have responsibility for developing, operating, and maintaining archive and storage systems for operational POES data and derived products. The following subsections describe these organizations and systems.

2.1.2.1 Central Environmental Satellite Computer System

The Central Environmental Satellite Computer System (CEMSCS) consists of distributed hardware and software systems that perform instrument data ingest, data preprocessing, product processing, selected product distribution and near-line storage of selected data sets. The Office of Satellite Data Processing and Distribution (OSDPD) Information Processing Division (IPD) maintains and operates an Amdahl Trigger 732 mainframe computer (3 CPUs @ 65 MIPS each, also known as the IPD Enterprise Server, or IPD/ES) running the IBM MVS/ESA operating system and a CRAY J916 supercomputer running Unicos in Suitland, Maryland to process the majority of operational products for the NOAA POES program. OSDPD Satellite Services Division (SSD) operates a Dell personal computer running the Red Hat Linux operating system to generate data products in Camp Springs, Maryland.

The NOAA polar satellite products available through CEMSCS include NOAA Level 1 data bases for each of the on-board instruments and derived Level 2 and 3 products in the areas of atmospheric soundings, sea surface temperatures, radiation budget, atmospheric aerosols, vegetation index, snow and sea ice cover, cloud parameters, precipitation, imagery data, and ozone monitoring.

NOAA Level 1b data sets and derived products generated within CEMSCS are uniquely named and staged on the IPD/ES for distribution to NOAA's primary users. The IPD/ES also catalogs and migrates all NOAA Level 1b data sets and selected Level 2 and 3 derived products from disk storage to an IBM 3495 robotic tape system under the control of IBM's Storage Management

Subsystem (SMS). The IBM 3495 robotic system currently provides capacity for 6,000 IBM 3590 MAGSTAR tape cartridges, which can store up to 10 Gigabytes (GB) of data per cartridge.

2.1.2.2 NOAA National Data Centers

The NOAA National Data Centers (NNDC) perform the long-term data archive and management functions within NOAA. The responsibilities of the constituent data centers and the archive systems that they operate are described in the following subsections.

2.1.2.2.1 National Climatic Data Center

The National Climatic Data Center (NCDC), located in Asheville, North Carolina, is the largest data center of the NOAA National Data Center system within NESDIS. It is also the World Data Center-A for meteorology. NCDC currently archives more than 700 Terabytes (TB) of environmental data, from *in situ* and remote sensing platforms. NCDC archives 99 percent of all NOAA data, including over 320 million paper records; 2.5 million microfiche records; over 500,000 tape cartridges/magnetic tapes, and has satellite weather images back to 1960. NCDC maintains over 500 digital data sets and responds to over 200,000 requests each year. NCDC operationally develops national and global data sets that have been used by both government and the private sector to maximize the resource provided by our climate and minimize the risks of climate variability and weather extremes. The Center has a statutory mission to describe the climate of the United States and NCDC acts as the Nation's Scorekeeper regarding the trends and anomalies of weather and climate. NCDC's climate data have been used in a variety of applications including agriculture, air quality, construction, education, energy, engineering, forestry, health, insurance, landscape design, livestock management, manufacturing, recreation and tourism, retailing, transportation, and water resources management among other areas.

Currently, NCDC ingests POES data operationally (approximately 5 Gigabytes per day) by file transfer protocol (ftp) [“push”](#) from the IPD/ES to an IBM RS/6000 ingest server at NCDC's Asheville site. The communications link is via two load balanced T1 communications lines with a combined data rate of 3 Megabits per second (Mb/s). These data are subsequently cataloged in an Oracle database and migrated to NCDC's Hierarchical Data Storage System (HDSS). The HDSS is comprised of IBM RS/6000 SP processors, an IBM 3494 robotic tape library using IBM 3590 128-track drive technology, and the IBM High Performance Storage System (HPSS) software. Currently, the HDSS has a capacity of 80 TB.

2.1.2.2.2 National Geophysical Data Center

The National Geophysical Data Center (NGDC), located in Boulder, Colorado, is responsible for the acquisition, management, and preservation of geophysical data. It also hosts the World Data Centers for Glaciology, Marine Geology & Geophysics, Paleoclimatology, Solar-Terrestrial Physics, and Solid Earth Geophysics. NGDC plays an integral role in the nation's research into the environment, and at the same time provides public domain data to a wide variety of users.

NGDC's data holdings currently contain more than 300 digital and analog databases, some of which are very large. The Data Center continually develops data management programs that reflect the changing world of geophysics.

2.1.2.2.3 National Oceanographic Data Center

The National Oceanographic Data Center (NODC), located in Silver Spring, Maryland, manages the acquisition, ingest processing, quality control and long-term preservation of oceanographic data. Oceanographic data in digital form is sorted, categorized and assigned unique identification numbers at ingest (non digital data and information are normally incorporated in the NOAA Library, but are always considered for future conversion to digital form to support modern access and retrieval methodologies). The data are scanned for viruses, and cryptographic checksums are generated and stored with the original data files so data integrity can be monitored and verified over extended time periods and across generations of storage technologies. A copy of the data is written to near-line mass storage and a copy is written to removable media for off-site storage. A number of data products are derived from the NODC data holdings to extend the utility of the data and information.

The NODC archive holdings include all the data acquired in its original form, and project and product files of data extractions. Every data acquisition is assigned a unique identification number to be used as a life time reference to that data. All data are passed through a context verification prior to entry into the NODC data holdings. Also, checksum and byte count values are computed to tag to the data for continuous validation and verification processes used to maintain the integrity of the data. Metadata describing each acquisition are appended new data for internal record management. Each unique data set referenced in the NOAA and NNDC server systems contains a metadata description to aid in search and discovery processes.

A copy of all NODC digital data holdings is maintained in an online storage system for unattended access. A backup copy is preserved off-site for disaster recovery purposes. Another periodically refreshed backup copy is maintained for internal system recovery. Periodic data migration is required to mitigate system and media form-factor obsolescence. Currently no efforts are made to re-characterize the data holdings over time to ensure refinement of future access paradigms. Current data volumes enable migration process to be performed within base budget limitations. However, data from significantly enhanced sensor technologies, i.e., new satellite systems and remote surface platforms such as expected expendable ocean buoy systems, will produce capacity growth beyond the center's capability to manage within current funding support levels. Preservation efforts and costs will compound over time with the current policies to maintain all acquired data for perpetuity.

The network infrastructure at NODC is based on Transmission Control Protocol/Internet Protocol (TCP/IP) and currently operates at 100 Mb/s internally. External connection from NODC to the campus network and to external campus or Internet destinations currently passes through a 10 Mb/s router (due for upgrade to 100 Mb/s in Fiscal Year 2001). There are also two 512 Kilobits per second (Kb/s) Frame Relay circuits that provide backup connectivity to the NCDC and the NGDC. The NODC network infrastructure is currently segregated into a number of public and private sub-nets by way of packet filtering firewalls that also provide Network

Address Translation (NAT). Additionally, various automated intrusion detection systems are operated to monitor and report unauthorized connection attempts to NODC systems. NODC provides public access servers to support standard Internet protocols including, Simple Mail Transfer Protocol (SMTP), Hyper Text Transfer Protocol (HTTP) and ftp. NODC also develops and provides tools to support public submission of data for archival storage at NODC, and public online access to certain archived data sets.

NODC operates many desktop systems running operating systems including Unix variants (Solaris, Linux, Irix), Microsoft Windows variants (98, NT, ME) and Mac OS. These workstations are used for day-to-day operations in data ingest, maintenance, quality assurance, customer services, application development, web publishing, and for personnel productivity.

NODC currently operates two magneto-optical jukebox systems for near-line mass storage as well as a number of Digital Linear Tape (DLT) and IBM 3590 tape media systems for backup and archive and for off-line storage. The magneto-optical jukeboxes have a capacity of approximately 2 TB for near-line storage. Unlimited storage capacity is available off-line removable media storage (i.e., magneto-optical disk or tape cartridge media). NODC operates automated systems to perform regular virus scans of data in near-line storage both during ingest and periodically thereafter. NODC operates automated systems to generate cryptographic checksums of all digital archive data so that its integrity can be verified at any time. This allows for a high degree of confidence that any data corruption due to media failure or accidental or intentional destruction can be easily detected so data can be recovered from off-line backup media. It also allows for data migration across future generations of storage media and systems with a high degree of confidence in the inherent data integrity.

NODC also operates a number of high-capacity RAID (Redundant Array of Inexpensive Disks) disk storage systems to support data ingest, working storage, online products and database search and retrieval systems.

Tape jukebox systems are maintained at NODC to provide automated and manual backup facilities supporting the NODC workstations and servers as well as near-line mass storage jukeboxes (the backup copy results in a third copy of the original data). These systems currently use DLT technology and run under the control of Legato Networker backup software. Tape media systems are maintained to support data retrieval from legacy tape formats such as 9 track and to copy data to IBM 3590 tape media for offsite, deep-storage archive. Other tape systems are provided for backup and restore of database and critical data and information servers.

2.1.2.3 Space Environment Center

The Space Environment Center (SEC) in Boulder, Colorado is part of the National Weather Service (NWS) National Centers for Environmental Prediction (NCEP). The SEC is responsible for the archive of POES data related to the near-earth space environment, specifically data collected by the Space Environment Monitor (SEM) instrument on the NOAA POES spacecraft.

The SEC in Boulder, Colorado retrieves the NOAA SEM-2 Level 1b data sets from the IPD/ES on a daily basis using ftp [“pull”](#) over a leased telecommunications line. These data sets have a

minimum residence time of one day on the IPD/ES server, after which they are deleted automatically from the system.

The SEC receives the NOAA SEM-2 Level 1b data sets and performs further processing before adding the SEM-2 data to their database. SEC processing reduces the product size in part by moving the orbit number, the spacecraft ID, and the orbit inclination from the header record into spare fields in the data record. Each bit of the instrument data in the Level 1b data record (bytes 89 through 166) is inverted to undo the condition described in Configuration Change Request (CCR) 1322 (RD-7). The SEC also takes the 1's complement of these 8-bit data words to convert them to the proper form, so that the scale factors for temperatures, voltages, and other parameters can be used without change. The SEC archives this product in the SEM-2 database and provides for backup and long-term preservation of the archive at the NGDC.

2.2 Access

This section contains a mission statement for NOAA's POES data access systems and descriptions of the current systems and organizations responsible for providing access to NOAA's archive and storage systems.

2.2.1 Mission

It is the mission of NOAA's data access systems to provide end users with accurate and timely access to inventory information and data from NOAA's archive and storage systems.

2.2.2 Current System Description

As with the NOAA's archive systems, responsibility for developing, operating, and maintaining POES data access systems is distributed across several organizations. The following subsections describe these organizations and the data access services that they provide.

2.2.2.1 Satellite Active Archive

The Satellite Active Archive (SAA) in Camp Springs, Maryland is NOAA's premier online facility for the distribution of NOAA and U.S. Department of Defense (DoD) POES data and derived data products. Operated by IPD, the SAA is currently supported by funding allocated through NOAA's Strategic Initiative for Seasonal-to-Interannual Climate Change. Additional resources are provided through the NOAA Earth System Data and Information Management (ESDIM) Program Office, the National Ice Center (NIC), and NOAA's Office of Research and Applications (ORA) for specific data management and data distribution services. Progress and performance are tracked through the NOAA-wide Information Technology (IT) initiative planning process by the NOAA Office of Administration as well as through the NESDIS Fiscal Year Operating Plan.

The SAA is currently operated and maintained by a staff of one (1) government employee and twelve (12) contractor personnel under IPD's Central Satellite Data Processing (CSDP) contract with Computer Sciences Corporation (CSC). Government personnel are responsible for

managing the programmatic, technical, and administrative functions of the SAA, while the contractor staff is responsible for daily operations, adaptive maintenance, and development of SAA systems. Both the government and contractor teams share responsibilities for short- and long-term system planning and for daily system monitoring and customer interaction. Additionally, NCDC and SAA share data distribution responsibilities for Defense Meteorological Satellite Program (DMSP) data under a Memorandum of Understanding with the National Aeronautics and Space Administration (NASA) for the Earth Observing System (EOS) Program.

The SAA is implemented with a modern client-server architecture composed of clustered UNIX processors closely coupled with the IPD/ES, the CEMSCS IBM 3495 robotic tape library, and several dedicated and broad-band telecommunications hubs. The SAA provides data to customers in three basic modes: user-interactive access (aperiodic, customer-selected criteria); automated distribution (periodic, customer predefined criteria); and subscription services (event-driven, customer-defined criteria). Interactive access is provided through a World Wide Web (WWW) server. Automated and subscription distributions are commonly processed through automated ftp services established through direct interface with the individual customer(s).

The SAA is a fully operational system within OSDPD/IPD. The SAA electronically distributed over 1.5 TB of polar satellite data and derived data products to its customers in 1998 and continues to see growth. In 1998, major upgrades to the IPD hardware architecture included the replacement of the central mainframe computer with a state-of-the-art enterprise server; the upgrade of the SAA robotic tape storage and retrieval system; and the replacement of outmoded SAA UNIX servers with state-of-the-art IBM SP/2 processors "closely coupled" to the enterprise server. Additionally, the SAA increased online storage capacity by 360 gigabytes with the acquisition of a high capacity magnetic disk array for the dedicated storage of satellite browse imagery.

In Fiscal Year (FY) 1998, the SAA began the implementation of new software systems that couple commercial off-the-shelf (COTS) relational database software with SAA-developed, object-oriented (OO) code to replace the then existing client-server operations. System Release 1.6 was the initial phase of the OO implementation and coincided with the launch of and subsequent data distribution from NOAA-K (now NOAA-15). In FY 1999, Release 1.7 completed the implementation of the OO architecture with the exception of the SAA Delivery Server. Release 2.0 integrated the new IBM SP hardware architecture to form the basis for polar satellite data distribution through FY 2003.

The SP hardware architecture features high capacity disk caching and networked data storage. The current configuration is scaled at eight (8) central processors and may be expanded to 32 processors when and if required. This increased processing and data sharing capacity reduces end-to-end processing and I/O time significantly, thus reducing time between customer data requests and actual data delivery. Additionally, the processors will be configured to provide total operational server redundancy, virtually eliminating system downtime and providing uninterrupted customer access.

2.2.2.2 NOAA National Data Centers

The NOAA National Data Centers are responsible for promoting the use of environmental data and information through full and open access and exchange to the fullest extent possible. Much of the data archived by the Data Centers are available for COFUR (Cost of Furnishing the User Request), yet a substantial amount of online information is available free of charge. While the Data Centers distribute data and supporting documentation on physical media, they also co-manage the National Virtual Data System (NVDS) and the NNDC Online Store to encourage online access to data and information from and about the NNDC archives.

The following subsections highlight data access services specific to each data center.

2.2.2.2.1 National Climatic Data Center

NCDC provides data to customers through CD-ROM, physical media, posters, published reports and Internet access to environmental data stored on the HDSS (described in section 2.1.2.2.1) and RAID arrays. As soon as digital data arrive at NCDC and are pre-processed, they are made available via Web access. Many of NCDC's standard products can be ordered online through the NNDC Online Store (whose servers are maintained and operated by NCDC).

NCDC is striving to put all of its archive into the HDSS so that all data and metadata will be available in digital form in near-online fashion. However, data migration resources must be found and substantial upgrades to the HDSS must be accomplished to reach this goal. In the meantime, much of the digital data available at NCDC resides only on rack-mounted magnetic tapes that must be retrieved by computer operators. NCDC makes extensive use of internal networks to allow for data transfer to and from the offline archive. NCDC has more than 500,000 tape cartridges, including all of the POES data from 1978 to the present. NCDC handles orders for POES data that cannot be processed by SAA, particularly large orders that require delivery on physical media or special handling.

NCDC also provides a variety of customer support services. NCDC assists customers by mail, phone, FAX, and Internet with finding and ordering data, creates custom climate products to meet specific customer requirements, and publishes reports and documents about data in the archive. NCDC operates the Help Desk for both NCDC and SAA customers of NOAA POES data and products. NCDC also edits, maintains, and distributes NOAA's documentation for POES data users, including the NOAA-KLM User's Guide, the NOAA Polar Orbiter Data User's Guide, and the Global Vegetation Index User's Guide.

2.2.2.2.2 National Geophysical Data Center

NGDC offers a wide range of both standard and custom data products. Much of NGDC's data is available online for free download, and many databases have web interfaces that help customers search for and download data in a convenient form. In addition, NGDC develops and distributes free data access tools such as GeoVu (view a variety of widely used data formats for point and image data) and FreeForm (translate between data formats).

Some of NGDC's most popular products are CD-ROM data sets, posters, published reports, and slide sets. Standard CD-ROM, poster, and slide set products are each described in Center-wide data announcements. These announcements link to the NNDC Online Store and to web pages with more information about each product.

NGDC's standard products can be ordered directly from the NNDC Online Store. An even wider range of data and information, both standard and custom, can be found by following the links on NGDC's home page to a data discipline of interest, then finding data of interest within that discipline. Typically, the customer will find data, images, software utilities, and other information under each discipline link.

NGDC distributes selected subsets of NOAA POES products on CD-ROM, including archived SEM data, Global AVHRR Derived Land Climatologies, NOAA/NASA Pathfinder Climate Data, and Time Series of Global Vegetation Cover.

2.2.2.2.3 National Oceanographic Data Center

Information describing the archive data is posted to NODC and NOAA databases and access servers to enable search and retrieval processes.

Various projects at NODC also provide online, public access to certain data sets or products via the Internet by way of the World Wide Web, ftp and CD-ROM media. Access to the data and its descriptions, which include both metadata and browse products, are generally available at no cost. The delivery of data and derived products are available on a cost recovery basis. Electronic commerce capabilities have been recently implemented to support untended around-the-clock access, retrieval and delivery of data and information. At the same time, manual assistance is provided during normal duty hours to assist in the understanding of the NODC databases, and for responding to requests for custom products. Science discipline specialists are available to promote expanded acquisition and utilization of data and to offer interpretive assistance.

Access is the key element in the data archive paradigm, as data are only valuable if it can be acquired. As the number of data sets and data volumes increase dramatically as anticipated with projected future programs and technologies, dynamism of the search and discovery processes supporting access will determine the measure of data utility. All NODC data can be accessed through the Internet either directly through the NODC home page or via pointers served by the NOAA and NNDC Server systems. New capabilities have been installed to enable users to find and access the NODC data holdings and to download desired records/files and establish payment for the associated cost of recovery through an online e-commerce transaction. NODC also offers user assistance services during normal duty hours to assist in navigating through the NODC data holdings and to process customized orders for data.

The NODC scientists become involved in or participate in research projects to develop and maintain a comprehensive understanding of the data and information contained within the archive record. In addition, research projects are conducted in response to user requests for custom products derived from the data holdings. Center scientists also develop analyses and

content assessment products, data visualization tools, and data description tools to expand the utility of the data and information holdings to a larger more diverse community now connected through the Internet. The assessment processes to determine the measure of integrity and continuity, where appropriate, are appended to the data throughout its life. These processes are part of the data accountability for archiving data. Data visualization and description tools are outreach processes, or in a commercial environment where the centers must recover cost of reproduction, marketing. These efforts are leading to data mining techniques to be able to extract event data or categorize data to enable and aid users in the data discovery processes, especially necessary as the data volumes and diversity of data types expand to incomprehensible levels.

The accountability information processed from the original data is included in the metadata maintained on the NODC servers. Visualization and descriptive products are used for a variety of purposes from publications and journal articles to web page viewing tools to market data availability and utility. In some cases, these outputs become a product level in the hierarchy of data (in NOAA's case, Level 2 and 3 products).

3.0 System Requirements to Support IJPS

3.1 Archive System Requirements

Requirements are presented in delineated paragraphs of text, including a requirements header and text paragraphs. Each section contains the following requirement categories:

- **Functional** - Input, output, data transforms, calculations, external interfaces, communications, and special management information needs.
- **Performance** - External workloads, internal function workloads, throughput and response times, data quality, integrity, accuracy, system capacity, reliability, availability, maintainability, Human workload and performance, growth, flexibility, expandability, and fault isolation and location.
- **Interface** - Unique aspects of the system and how it must interact with other processing systems or other components of the polar ground system.
- **Operational** - Human factors, including human-computer interfaces, system operational environment, system monitoring and configuration control, training, support capabilities, maintenance, logistics, facilities, safety, physical security, implementation sites, and operating/maintenance documentation.

The format for requirements identification is as follows:

Requirement Identifier (ID)	Verification Method
Text Paragraph [Source Requirement]	

Requirement Identifier: This tag uniquely identifies the requirement within the document.

Verification Method: This descriptor defines the selected method of verification for the requirement as described in Table 3-1.

Table 3-1. Verification Methods

Verification Method	Definition
Analysis	Analysis is an engineering assessment and/or mathematical process that may include computer modeling and/or simulation to determine compliance with specification requirements.
Demo	Demonstration is the determination of properties and performance involving proof-by-doing.
Inspection	Inspection is the examination or measurement of product characteristics or the review of design, production or test documentation to determine compliance with specified requirements.
Test	Test is the exercise of hardware, software, or operations to measure quantitatively specified requirements.
Joint Test (JT)	Joint test is the exercise of hardware, software, or operations that involve both the POES and EUMETSAT Polar System (EPS) to jointly accomplish the desired objective(s).

3.1.1 Functional Requirements

ARFR-010 Demo
The archive system shall comply with CLASS functional requirements. [AD-2: 1.1]

ARFR-020 Demo
The archive system shall be capable of ingesting all Level 1 data sets from new and upgraded IJPS instruments, associated metadata and ancillary data. [AD-1: PDAA-3.3.5.1-020; PDAA-3.3.5.1-030; PDAA-3.3.5.1-040; PDAA-3.3.5.1-050]

ARFR-030 Demo
The archive system shall be capable of ingesting all Level 2 and Level 3 data sets generated by the Product Generation and Distribution (PGD) element in the IJPS time period. [AD-1: 3.3.5.1-040]

ARFR-040 Demo
The archive system shall be capable of producing browse images from [TBD] data sets that are new or modified in the IJPS time period. [AD-2: 3.1.1.8]

ARFR-050 Inspection
The archive system shall adhere to the NOAA metadata standard to describe IJPS data sets in the inventory. [AD-3]

3.1.2 Performance Requirements

ARPR-010 Analysis
The archive system shall meet or surpass CLASS performance requirements. [AD-2: 1.1]

AAPR-020

Analysis

The archive system shall be capable of ingesting, at a minimum, the daily volume of all NOAA instrument data (AVHRR/3, HIRS/4, AMSU-A1, AMSU-A2, MHS, [A-]DCS, SEM/2 and SBUV/2), produced and openly available data. [AD-1: PDAA-3.3.5.4-010]

ARPR-030

Demo

The archive system shall be capable of ingesting IJPS data, metadata, and derived data products concurrently. [Derived]

ARPR-040

Demo

IJPS era derived product data sets shall be received within 24 hours of creation [Derived from AD-2: 3.3.3.1].

ARPR-050

Analysis

Electronic connectivity to IPS and PGD elements will be via dedicated, NESDIS managed links capable of transmitting 150% of the anticipated daily operational data streams in a 24 hour period. [AD-2: 3.3.2.1]

ARPR-060

Demo

The archive system shall perform data completeness and accuracy validation within 24 hours of the completion of IJPS data set transmission. [AD-2: 3.3.4]

3.1.3 Interface Requirements

ARIR-010

Demo

The archive system shall provide an interface with the IPS element for ingest of Level 1 data sets, associated metadata and ancillary data. [AD-1: PDAA-3.3.5.3-010]

ARIR-020

Demo

The archive system shall provide an interface with the PGD element for ingest of Level 2 and Level 3 data sets. [AD-1: PDAA-3.3.5.3-020]

3.1.4 Operational Requirements

AROR-010

Inspection

The archive system shall meet CLASS operational requirements. [AD-2: 1.1]

AROR-020

Inspection

The archive system shall maintain a geographically separate backup copy of all IJPS data received. [AD-1: PDAA-3.3.5.1-010; AD-2: 3.2.1.9]

AROR-030

Inspection

SEC shall be responsible for management of the Metop SEM-2 data archive. [Derived]

AROR-040

Inspection

NODC shall be responsible for management of the ASCAT data archive. [Derived]

AROR-050 Inspection
NCDC shall be responsible for management of the Metop AVHRR data archive. [Derived]

AROR-060 Inspection
NCDC shall be responsible for management of the Metop AMSU-A data archive. [Derived]

AROR-070 Inspection
NCDC shall be responsible for management of the IASI data archive. [Derived]

AROR-080 Inspection
NCDC shall be responsible for management of the GOME data archive. [Derived]

AROR-090 Inspection
NCDC shall be responsible for management of the GRAS data archive. [Derived]

AROR-100 Inspection
NCDC shall be responsible for management of the HIRS/4 data archive. [Derived]

AROR-110 Inspection
NCDC shall be responsible for management of the MHS data archive. [Derived]

AROR-120 Inspection
NCDC shall be responsible for management of the NOAA CPIDS database archive. [Derived]

AROR-130 Inspection
NCDC shall be responsible for management of the NOAA-N/N' Four Line Element (4le) ephemeris database archive. [Derived]

AROR-140 Inspection
NCDC shall be responsible for management of the Metop Orbital State Vectors (OSV) ephemeris database archive. [Derived]

3.2 Access System Requirements

Access System Requirements are categorized as described in Section 3.1, Archive System Requirements.

3.2.1 Functional Requirements

ACFR-010 Demo
The access system shall comply with CLASS functional requirements. [AD-2: 1.1]

ACFR-020

Demo

The access system shall be capable of distributing IJPS pre-processed recorded data, derived products, associated metadata, and ancillary data to the NOAA user community. [AD-1: PDAA-3.3.5.1-070; PDAA-3.3.5.1-080; PDAA-3.3.5.1-090]

ACFR-030

Inspection

The access system shall accept and register new customers in accordance with US Government policies regarding customer privacy. [AD-2: 3.2.3]

ACFR-040

Inspection

The access system shall generate, archive, maintain, and distribute documentation for users of NOAA instrument data and derived products in the IJPS time period. [AD-2: 3.1.8.3; 3.2.1.11]

ACFR-050

Inspection

The access system shall operate in accordance with the data denial policies [TBW, see RD-8] for IJPS data. [AD-2: 3.2.2.4].

ACFR-060

Demo

The access system shall provide authorized users with secure (e.g. encrypted) access to NOAA POES Four Line Element ephemeris data during periods when public access is restricted. [AD-1: PSYS-3.1.1-180]

ACFR-070

Inspection

The access system user interface shall allow for compatibility with EPS data set naming conventions. [AD-4]

ACFR-080

Demo

The access system shall provide digital signatures with all IJPS data distributed to the NOAA user community. [AD-2: 3.2.6.1]

3.2.2 Performance Requirements

ACPR-010

Test

The access system shall meet or exceed the CLASS performance requirements. [AD-2: 1.1]

ACPR-020

Analysis

The access system shall fulfill customer requests for online electronic delivery of IJPS data and derived products based upon volume ([TBD] GB per day). [AD-2: 3.2.6.5; 3.3.7.3]

ACPR-030

Analysis, Demo

For customer requests for IJPS data and derived products on computer compatible media, the access system shall fulfill orders based on volume of the request (e.g. [TBD] tapes per day) following validation of payment of any required costs of reproduction. [AD-2: 3.2.6.5]

3.2.3 Interface Requirements

ACIR-010

Demo

AAS shall provide an interface for IJPS data and derived product distribution to the NOAA user community. [AD-1: PDAA-3.3.5.3-030]

ACIR-020

Demo

The access system shall allow for linkages (HTTP hyperlinks) to the EUMETSAT Unified Meteorological Archive Retrieval Facility (UMARF) access system [TBC]. [AD-4]

3.2.4 Operational Requirements

ACOR-010

Inspection

The access system shall operate in accordance with NOAA and US Government regulations regarding distribution of US Government data including, but not limited to, sanctions documented by the US Treasury Department Office of Foreign Assets Control. [AD-5]

ACOR-020

Inspection

The access system shall operate in accordance with EUMETSAT and NOAA agreements regarding redistribution of EUMETSAT instrument data and products. [TBW]

ACOR-030

Inspection

The access system shall operate in accordance with US Space Command (USSC) and NOAA agreements regarding redistribution of Four Line Element ephemeris data. [DoD Policy]

4.0 Keywords with Definitions

BLIND ORBIT GAC – A GAC orbital data set that could not be downloaded to either of NOAA’s CDAs (Fairbanks or Wallops) at the time that the orbit was completed, but which is made available to NOAA by other means. In the IJPS era, blind orbit GAC will be downloaded by EUMETSAT and provided to NOAA in [pipeline mode](#).

FTP “PULL” – An electronic data transfer using file transfer protocol initiated by the receiving system, usually on a scheduled polling basis.

FTP “PUSH” – An electronic data transfer using file transfer protocol initiated by the data server, usually on a schedule or event-driven basis.

PIPELINE MODE – a processing mode that compensates for limited communication bandwidth. It pertains to a chain of processors that are applied in sequence to orbital data. In pipeline mode, at any given moment, each of the processors works on a different piece (referred to as a granule) of the orbital data set, typically on the granule that was just completed by the preceding processor in the sequence.

5.0 Open Issues

5.1 TBC

ACIR-020: “The access system shall allow for linkages (HTTP hyperlinks) to the EUMETSAT Unified Meteorological Archive Retrieval Facility (UMARF) access system.”

At this time, the NOAA and EUMETSAT discussions have been limited to web links between access system user interfaces. However, future developments could allow for further interface integration including cross-site data inventory searching.

5.2 TBD

ARFR-040: “The archive system shall be capable of producing browse images from selected data sets [TBD] that are new or modified in the IJPS time period.”

NOAA will review and determine which data sets and products are appropriate for browse imagery. Metop 1km AVHRR is a certainty, but other new and upgraded IJPS data sets may require browse image development.

ACPR-020: “The access system shall fulfill customer requests for online electronic delivery of IJPS data and derived products based upon volume ([TBD] GB per day).”

NOAA will determine system capacity as the CLASS architecture matures.

ACPR-030: “For customer requests for IJPS data and derived products on computer compatible media, the access system shall fulfill orders based on volume of the request (e.g. [TBD] tapes per day) following validation of payment of any required costs of reproduction.”

NOAA will determine system capacity as the CLASS architecture matures.

5.3 TBW

ACFR-050: “The access system shall operate in accordance with the data denial policies [TBW, see RD-8] for IJPS data.”

Data denial policies governing distribution of data from NOAA’s near-real time archive and access systems are expected pending further discussions between NOAA, DoD, and EUMETSAT. CLASS provides the generic requirement for data denial capability [AD-2: 3.2.2.4].

ACOR-020: “The access system shall operate in accordance with EUMETSAT and NOAA agreements regarding redistribution of EUMETSAT instrument data and products. [TBW]”

NOAA and EUMETSAT are currently engaged in discussions regarding NOAA’s license to redistribute data from EUMETSAT instruments to third parties.

Appendix A. Requirements Matrix

Requirement ID	Requirement Statement	Source Requirement	Allocated Requirements	Verification Level & Method			Rationale / Comments
				A – Analysis D – Demonstration I – Inspection J – Joint Test T – Test	Ele.	PGS	IJPS
	<u>3.1 Archive System Requirements</u> <u>3.1.1 Functional Requirements</u>						
ARFR-010	The archive system shall comply with CLASS functional requirements.	AD-2: 1.1		D			
ARFR-020	The archive system shall be capable of ingesting all Level 1 data sets from new and upgraded IJPS instruments, associated metadata and ancillary data.	AD-1: PDAA-3.3.5.1-020; PDAA-3.3.5.1-030; PDAA-3.3.5.1-040; PDAA-3.3.5.1-050		D	D		
ARFR-030	The archive system shall be capable of ingesting all Level 2 and Level 3 data sets generated by the Product Generation and Distribution (PGD) element in the IJPS time period.	AD-1: 3.3.5.1-040		D	D		
ARFR-040	The archive system shall be capable of producing browse images from [TBD] data sets that are new or modified in the IJPS time period.	AD-2: 3.1.1.8		D			
ARFR-050	The archive system shall adhere to the NOAA metadata standard to describe IJPS data sets in the inventory.	AD-3		I			
	<u>3.1.2 Performance Requirements</u>						
ARPR-010	The archive system shall meet or surpass CLASS performance requirements.	AD-2: 1.1		A	A		
ARPR-020	The archive system shall be capable of ingesting, at a minimum, the daily volume of all NOAA instrument data (AVHRR/3, HIRS/4, AMSU-A1, AMSU-A2, MHS, [A-JDCS, SEM/2 and SBUV/2], produced and openly available data.	AD-1: PDAA-3.3.5.4-010		A			
ARPR-030	The archive system shall be capable of ingesting IJPS data, metadata, and derived data products concurrently.	Derived		D	D		
ARPR-040	IJPS era derived product data sets shall be received within 24 hours of creation (TBC).	Derived from AD-2: 3.3.3.1		D	D		
ARPR-050	Electronic connectivity to IPS and PGD elements will be via dedicated, NESDIS managed links capable of transmitting 150% of the anticipated daily operational data streams in a 24 hour period.	AD-2: 3.3.2.1		A	A		
ARPR-060	The archive system shall perform data completeness and accuracy validation within 24 hours of the completion of IJPS data set transmission.	AD-2: 3.3.4		D			

Requirement ID	Requirement Statement	Source Requirement	Allocated Requirements	Verification Level & Method			Rationale / Comments
				A – Analysis D – Demonstration I – Inspection J – Joint Test T – Test			
				Ele.	PGS	IJPS	
	<u>3.1.3 Interface Requirements</u>						
ARIR-010	The archive system shall provide an interface with the IPS element for ingest of Level 1 data sets, associated metadata and ancillary data.	AD-1: PDAA-3.3.5.3-010		D			
ARIR-020	The archive system shall provide an interface with the PGD element for ingest of Level 2 and Level 3 data sets.	AD-1: PDAA-3.3.5.3-020		D			
	<u>3.1.4 Operational Requirements</u>						
AROR-010	The archive system shall meet CLASS operational requirements.	AD-2: 1.1		I			
AROR-020	CLASS shall maintain a geographically separate backup copy of all IJPS data received.	AD-1: PDAA-3.3.5.1-010; AD-2: 3.2.1.9		I			
AROR-030	SEC shall be responsible for management of the Metop SEM-2 data archive.	Derived		I			
AROR-040	NODC shall be responsible for management of the ASCAT data archive.	Derived		I			
AROR-050	NCDC shall be responsible for management of the Metop AVHRR data archive.	Derived		I			
AROR-060	NCDC shall be responsible for management of the Metop AMSU-A data archive.	Derived		I			
AROR-070	NCDC shall be responsible for management of the IASI data archive.	Derived		I			
AROR-080	NCDC shall be responsible for management of the GOME data archive.	Derived		I			
AROR-090	NCDC shall be responsible for management of the GRAS data archive.	Derived		I			
AROR-100	NCDC shall be responsible for management of the HIRS/4 data archive.	Derived		I			
AROR-110	NCDC shall be responsible for management of the MHS data archive.	Derived		I			
AROR-120	NCDC shall be responsible for management of the NOAA CPIDS database archive.	Derived		I			
AROR-130	NCDC shall be responsible for management of the NOAA-N/N' Four Line Element (4le) ephemeris database archive.	Derived		I			

Requirement ID	Requirement Statement	Source Requirement	Allocated Requirements	Verification Level & Method			Rationale / Comments
				A – Analysis D – Demonstration I – Inspection J – Joint Test T – Test			
				Ele.	PGS	IJPS	
AROR-140	NCDC shall be responsible for management of the Metop Orbital State Vectors (OSV) ephemeris database archive.	Derived		I			
	<u>3.2 Access System Requirements</u> <u>3.2.1 Functional Requirements</u>						
ACFR-010	The access system shall comply with CLASS functional requirements.	AD-2: 1.1		D			
ACFR-020	The access system shall be capable of distributing IJPS pre-processed recorded data, derived products, associated metadata, and ancillary data to the NOAA user community.	AD-1: PDAA-3.3.5.1-070; PDAA-3.3.5.1-080; PDAA-3.3.5.1-090		D			
ACFR-030	The access system shall accept and register new customers in accordance with US Government policies regarding customer privacy.	AD-2: 3.2.3		I			
ACFR-040	The access system shall generate, archive, maintain, and distribute documentation for users of NOAA instrument data and derived products in the IJPS time period.	AD-2: 3.1.8.3; 3.2.1.11		I			
ACFR-050	The access system shall operate in accordance with the data denial policies [TBW, see RD-8] for IJPS data.	AD-2: 3.2.2.4		I			
ACFR-060	The access system shall provide authorized users with secure (e.g. encrypted) access to NOAA POES Four Line Element ephemeris data during periods when public access is restricted.	AD-1: PSYS-3.1.1-180		D	D	D	
ACFR-070	The access system user interface shall allow for compatibility with EPS data set naming conventions.	AD-4		I			
ACFR-080	The access system shall provide digital signatures with all IJPS data distributed to the NOAA user community.	AD-2: 3.2.6.1		D			
	<u>3.2.2 Performance Requirements</u>						
ACPR-010	The access system shall meet or exceed the CLASS performance requirements.	AD-2: 1.1		T			
ACPR-020	The access system shall fulfill customer requests for online electronic delivery of IJPS data and derived products based upon volume ([TBD] GB per day).	AD-2: 3.2.6.5; 3.3.7.3		A			
ACPR-030	For customer requests for IJPS data and derived products on computer compatible media, the access system shall fulfill orders based on volume of the request (e.g. [TBD] tapes per day) following validation of payment of any required costs of reproduction.	AD-2: 3.2.6.5		A,D			

Requirement ID	Requirement Statement	Source Requirement	Allocated Requirements	Verification Level & Method			Rationale / Comments
				A – Analysis D – Demonstration I – Inspection J – Joint Test T – Test	Ele.	PGS	IJPS
	<u>3.2.3 Interface Requirements</u>						
ACIR-010	AAS shall provide an interface for IJPS data and derived product distribution to the NOAA user community.	AD-1: PDAA-3.3.5.3-030		D	D		
ACIR-020	The access system shall allow for linkages (HTTP hyperlinks) to the EUMETSAT Unified Meteorological Archive Retrieval Facility (UMARF) access system [TBC].	AD-4		D			
	<u>3.2.4 Operational Requirements</u>						
ACOR-010	The access system shall operate in accordance with NOAA and US Government regulations regarding distribution of US Government data including, but not limited to, sanctions documented by the US Treasury Department Office of Foreign Assets Control.	AD-5		I			
ACOR-020	The access system shall operate in accordance with EUMETSAT and NOAA agreements regarding redistribution of EUMETSAT instrument data and products.	[TBW]		I			
ACOR-030	The access system shall operate in accordance with US Space Command (USSC) and NOAA agreements regarding redistribution of Four Line Element ephemeris data	DoD Policy		I			

Appendix B. Acronyms and Abbreviations

24x7	24 hours per day by 7 days per week
4le	Four Line Elements (NOAA ephemeris)
AAS	Archive and Access System
AMSU	Advanced Microwave Sounding Unit
ASCAT	Advanced Scatterometer
AVHRR	Advanced Very High Resolution Radiometer
CCR	Configuration Change Request
CDA	Command and Data Acquisition Station
CD-ROM	Compact Disc–Read Only Memory
CEMSCS	Central Environmental Satellite Computer System
CLASS	Comprehensive Large Array-data Stewardship System
COFUR	Cost of Fulfilling a User Request
CONOPS	System Concept of Operations
COTS	Commercial Off-The-Shelf
CPIDS	Calibration Parameters Input Data Sets
CPU	Central Processing Unit
CSC	Computer Sciences Corporation
CSDP	Central Satellite Data Processing
DCS	Data Collection System
DLT	Digital Linear Tape
DMSP	Defense Meteorological Satellite Program
DoD	Department of Defense
EOS	Earth Observing System
ESDIM	Earth System Data and Information Management
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
ftp	file transfer protocol
FY	Fiscal Year
GAC	Global Area Coverage
GB	Gigabyte
GOME	Global Ozone Monitoring Experiment
GRAS	Global Navigation Satellite System Receiver and Atmospheric Sounding
HDSS	Hierarchical Data Storage System
HIRS	High-resolution Infrared Radiation Sounder
HPSS	High Performance Storage System
HTTP	Hypertext Transfer Protocol
IASI	Infrared Atmospheric Sounding Interferometer
IJPS	Initial Joint Polar-orbiting Operational Satellite System
IPD	Information Processing Division
IPD/ES	IPD Enterprise Server
IPS	Ingest and Preprocessing System
IT	Information Technology
Kb/s	Kilobits per second
MB	Megabyte
Mb/s	Megabits per second

MD5	Message Digest 5 algorithm
Metop	Meteorological Operational satellite
MHS	Microwave Humidity Sounder
MIPS	Million Instructions per Second
MVS/ESA	Multiple Virtual Storage/Enterprise System Architecture
NASA	National Aeronautics and Space Administration
NAT	Network Address Translation
NCDC	National Climatic Data Center
NCEP	National Centers for Environmental Prediction
NESDIS	National Environmental Satellite, Data, and Information Service
NGDC	National Geophysical Data Center
NIC	National Ice Center
NNDC	NOAA National Data Centers
NOAA	National Oceanic and Atmospheric Administration
NODC	National Oceanographic Data Center
NVDS	National Virtual Data System
NWS	National Weather Service
OO	Object Oriented
ORA	Office of Research and Applications
OSDPD	Office of Satellite Data Processing and Distribution
OSV	Orbital State Vectors (Metop ephemeris)
PGD	Product Generation and Distribution System
PGS	POES Ground System
POES	Polar-orbiting Operational Environmental Satellite
QA	Quality Assurance
RAID	Redundant Array of Inexpensive Disks
SAF	Satellite Application Facility
SBUV	Solar Backscatter Ultraviolet Spectral Radiometer
SEC	Space Environment Center
SEM	Space Environment Monitor
SMS	Storage Management Subsystem
SMTP	Simple Mail Transfer Protocol
SSD	Satellite Services Division
TB	Terabyte
TBC	To Be Confirmed
TBD	To Be Determined
TBR	To Be Resolved
TBS	To Be Supplied
TCP/IP	Transmission Control Protocol/Internet Protocol
UMARF	Unified Meteorological Archive and Retrieval Facility
USSC	United States Space Command
WWW	World Wide Web

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